Apart from the fact that this would give a negative velocity, that is, a contraction, the method itself seems to be illegitimate. Equation (1) is derived on the explicit assumption that R is not a function of t. When R is a function of t, (1) must be replaced by

$$\left(\frac{dR}{dt}\right)^2 + 1 = \tfrac{1}{3}R^2\lambda + \frac{4M}{3\pi R} \qquad . \qquad . \quad (2)$$

where λ is Einstein's cosmical constant.[1] From (2) and related equations Eddington[2] has shown that Einstein's universe is unstable, so that when once disturbed it will expand or contract even if the total mass remains constant. He has further shown that if the initial disturbance were a conversion of matter into radiation it would actually start a *contraction*.

Prof. Haas does not state whether he is considering the *proper* mass or the *relative* mass. The latter does not change when matter is converted into radiation. If the proper mass is to be understood, a relation of his proposed type might hold good, apparently, only if λ were to vary in a suitable manner with the total amount of matter present. I am not aware that such a possibility has ever been suggested.

W. H. McCREA.

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University of Edinburgh,
Nov. 10.

[1] Lemaître, *Annales de la Société Scientifique de Bruxelles*, **47** A, p. 49; 1927.
[2] *Mon. Not. Roy. Ast. Soc.*, **90**, p. 668; 1930.

A. HAAS deduces the equation :

$$v = 1 \cdot 1 \times 10^{-49}\, M,$$

where v represents 'cosmical velocity' and M the mass of the universe.[1] Taking $M = 1 \cdot 8 \times 10^{57}$ gm. he obtains $v = 2000$ km. per second and then says : " This value agrees well with the magnitude of the velocity with which the farthest spiral nebulæ appear to recede from us ".

As against this, I find that according to more recent investigations the mass of the universe is considerably less than $1 \cdot 8 \times 10^{57}$ gm. According to A. S. Eddington[2] we may assume that $M = 2 \cdot 3 \times 10^{55}$ gm. If we insert this value we obtain only $v = 25$ km. per second.

In the near future the *Zeitschrift für Physik* will publish my paper : " Einige Folgerungen aus den neuesten Ansichten von E. C. Stoner und von E. A. Milne über das Innere der Sterne ". In that article, among other subjects, I deal with the problem of the dissolution of matter, but from a totally different point of view from that of A. Haas.

WILHELM ANDERSON.

Tartu-Dorpat (Estonia),
Nov. 13.

[1] Arthur Haas, NATURE, **126**, p. 722; 1930.
[2] A. S. Eddington, *Mon. Not. Roy. Ast. Soc.*, **90**, p. 678; 1930.

Evidence for Quadripole Radiation.

THE $S \longrightarrow D$ transitions which occur in the alkali spectra are forbidden by the ordinary selection rules for the azimuthal quantum number. As they are still observable in absorption, the question arises whether they are due to the action of external electric fields and are still a dipole radiation from a perturbed atom, or whether they are due to quadripole radiation. Rubinowicz has calculated the Zeeman selection rules for quadripole radiation; they differ from the ordinary rules in that the change in the magnetic quantum number may have the values ± 2 in addition to the ordinary ones 0, ± 1. The polarisation also is quite different.

I have observed the transverse Zeeman effect of the 4642·17-4641·58 potassium doublet, which is an $S \longrightarrow D$ combination, and I have been able to show that its Zeeman pattern agrees with the predictions of Rubinowicz for quadripole radiation and not with those for dipole radiation. This transition is thus shown to arise from quadripole radiation.

Details will be published elsewhere.

EMILIO SEGRÈ.

Istituto Fisico della R. Università,
Roma, Nov. 7.

The Carbohydrate Complex of Serum Proteins and the Clinical Determination of 'Bound Sugar' in the Blood.

IN connexion with the reference to my work (Rimington : *Bioch. J.*, **23**, 430) upon the isolation of a carbohydrate complex from blood-serum proteins, made in an article in NATURE of Nov. 1, p. 704, it may be of interest to state that I have now extended these observations, with the consequence that I have somewhat modified my earlier conclusions.

The complex obtained from the proteins from horses' serum appears to be a *tri*saccharide structure (possibly polymerised) and not a *di*saccharide as originally suspected. This conclusion was announced to the Biochemical Society on May 17 of this year, and is to be found in the *Proceedings* of that Society published in *Chemistry and Industry*, May 23, 1930, p. 440.

Each molecule of glucosamine is associated with two molecules of mannose, thus giving a substance with the empirical formula $C_{18}H_{33}NO_{15}$ and containing 2·78 per cent nitrogen. A similar trisaccharide complex, which appears to be identical with that already described, has also been isolated from the mixed serum proteins of ox blood. All my preparations are optically inactive.

It is of interest that the nitrogenous impurity which was found to be present in the substance originally isolated proved to be histidine. For its complete removal prolonged and vigorous hydrolysis is required. Since the carbon and hydrogen content of histidine differs little from that of the sugar which was being isolated, the fact that its presence was unsuspected is capable of explanation.

More recently I have attempted to prepare sufficient of the so-called mucoid of blood serum to examine it for associated carbohydrate material. In view of Levene and Mori's recent findings in the case of ovomucoid (*J. Biol. Chem.*, **84**, 49), it seems possible that this protein of the serum, also, may prove to be carbohydrate containing.

Finally, I should like to add that the discovery of these complexes in serum albumin and globulin affords a satisfactory explanation of some of the contradictory observations of various authors upon the 'bound sugar' of the blood. Alkaline hydrolysis of the proteins leads to a non-reducing complex which is also unattacked by enzymes ; acid hydrolysis, on the other hand, yields reducing substances. Both glucosamine and mannose form an osazone identical with glucosazone, and such has frequently been isolated from the hydrolysed protein fractions of serum, but it is incorrect to assume, as has frequently been done, that the protein sugar is thus proved to be glucose.

Certain quantitative discrepancies between the results of various authors can be similarly explained. Bierry and Rathery (*C. R. de la Soc. Biol.*, **83**, 1890) give the figures for the protein sugar of horse plasma as about 0·13 per cent ; Dische (*Bioch. Z.*, **202**, 74) finds it to be about 0·22 per cent. The former authors deproteinised their solutions with a mercuric nitrate reagent, which also precipitates glucosamine, whilst